ESA-087 Final Public Report

Introduction:
Dow Chemical Company started its operations from this site and has grown into a multi-site & multi-national Chemical company over the years. The steam system of this site has undergone various transformations and at present, a large portion of its steam requirements are met from imported steam from the Midland Cogeneration Venture (MCV) located across the fence. The site also generates 400 psig steam to meet the needs in selective processes and waste heat steam from Thermal Oxidizers. The steam import agreement does not insist condensate return, and all the condensate is collected, but presently dumped into sewers at various buildings in the site without recovering much of the thermal energy. Boiler feed water to MCV is supplied from this site's De-Ionized Water plant.

Objective of ESA:
To provide U.S. industries technical assistance targeted to reduce fuel expenditure.

Focus of Assessment:
The focus of Energy (Steam) System Assessment (ESA) is as follows: (1) to identify energy waste reduction opportunities and (2) to train in-plant personnel to continue and sustain the improvement. This plant consumes steam mostly imported from MCV. Hence, this ESA is focused on the steam distribution network, steam users, and condensate recovery & return at the site.

Approach for ESA:
USDOE qualified specialist provided training to the plant engineer in the USDOE Steam Tools Suite and facilitate the completion of an abbreviated ESA of the facility.

General Observations of Potential Opportunities:
Natural gas is used in the site's two 400-psig boilers, Incinerator kilns, Thermal Oxidizers and in other Process heaters.

With the help of plant's engineering team, DOE's preliminary assessment in March-06 has identified the following potential opportunities to reduce natural gas usage: They are classified as Near, Medium & Long term opportunities.

(Near term: Any housekeeping improvements & minor changes in the operating practices,
Medium term: Simple modifications that does not change the initial process design,
Long term: Modifications that require changes in the process design & require large equipment)

1. Change Boiler Efficiency: The stack Oxygen levels in the 400-psig boilers would be reduced to about 5% from the present 6.4% level, without compromising the risk of increasing the NOx levels. (Near term)

2. Change Blowdown rate: The blowdown rate in the 400-psig boilers would be reduced to 1% from the present levels of 2%, as the make-up water quality is very good at this site. (Near term)

3. Implement Steam trap maintenance program: The site has over 6200 steam traps and a formal steam trap maintenance program would be initiated immediately to control the steam losses, and trap failures. (Medium term)

4. Change Condensate recovery rate: The condensates collected at the various buildings of this site are presently drained into the sewer or recycled as the Cogen plant is supplied with cold make-up water. Much of the heat content in the hot condensate is presently lost, while all the make-up De-Ionized water is heated with steam at the Cogen plant. A project could be developed to collect and send hot condensate back to the Cogen plant. (Medium term)

5. Reduce HP steam demand: Only two buildings at this site are currently using 400-psig steam, while all other process users have already changed their needs to either hot oil use or to 175-psig steam use. The calculated pipeline heat loss is over 25% in transporting steam to these 2 buildings from the boiler house, due to the large sized transport lines and the distance of transportation. Though an optimally sized new steam pipeline could reduce the line losses, it may be possible to eliminate the operation of 400-psig boilers itself by providing alternative process heating options at the two buildings. Hence alternative options are explored and identified to eliminate the losses in the 400-psig-steam system. (Medium term)

6. Reduce MP & LP steam systems demand: Due to change in process steam use at the various buildings over the years, the steam distribution piping at the site has many unused or sparingly used sections causing heat loss. The piping network distribution losses would be reduced by effectively utilizing the existing 175-psig & 25-psig steam pipeline network. (Medium term)

7. Add operation of backpressure turbine between 175-psig & 25-psig steam network: A backpressure turbine installation could recover shaft power from this steam pressure reduction. The site will explore recovering this potential shaft power generation from steam pressure reduction. (Long term)

Additional opportunities not covered by the SSAT model

8. Heat recovery from exhaust air duct of the HVAC system in Laboratory Buildings: One of the large laboratory buildings is operating on 100% fresh air, but without any heat recovery from exhaust air. Most other laboratory buildings have either partial or full heat recovery loops. Hence potential exists to save steam use in this building by installing a heat recovery loop. (Medium term)

9. Install cogeneration system at the Larkin laboratory buildings: Larkin laboratory buildings are located at a different location across the town. Presently, steam is generated and electricity is purchased to meet the utility demands of these buildings. Installing a Cogeneration unit to generate both electricity & steam would help to utilize natural gas in an efficient way and reduce the site's overall energy cost. (Long term)

10. Use alternate fuel: The waste incinerator kiln is one of the largest users of Natural gas at this site. Maintaining high temperatures is necessary in the process of solid waste incineration, which can be easily accomplished by pulverized coal firing. Since coal firing in kilns with clean environmental emissions is a well-established technique, this option should be explored at this site. (Long term)

The preliminary estimate of potential energy cost savings from the above 7 opportunities (excluding the additional ones not covered by the SSAT model) totals to $2.38 million annually. However, this is only a preliminary assessment and more detailed engineering and economic analysis is required to evaluate the cost effectiveness of the opportunities, especially for the large investment opportunities.

Management Support and Comments:
Dow Chemical is a global leader in better management of its facilities with high performance standards. A corporate level management team encourages any effort that reduces the natural gas usage at all of its plants located around the country. The Midland site team has shown great enthusiasm towards reducing the natural gas cost of their plant. They indicated actions for immediate implementation of the first five items of the above listed opportunities and the rest also would be explored after discussing with their colleagues in the other process buildings.

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